U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Technology Integration

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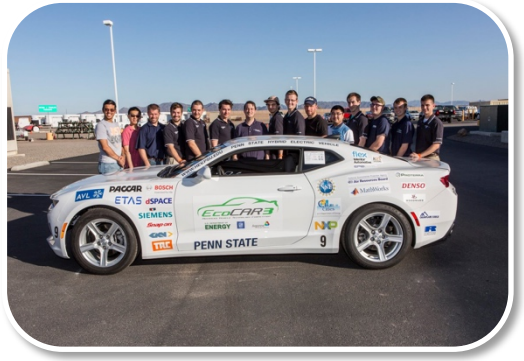
How Does Technology Integration Fit into VTO?

VTO develops advanced transportation technologies to:

- ✓ Improve energy ***efficiency***
- ✓ Increase domestic energy ***security***
- ✓ Reduce operating ***cost*** for consumers & business
- ✓ Improve global ***competitiveness*** of US economy

What is Technology Integration?

- Data and Systems Research
- Advanced Vehicle Technology Competitions (EcoCAR 3)
- State and Alternative Fuel Provider Fleet Program



VTO Budget

VTO Program Area	FY17 Enacted	FY18 Enacted
Batteries and Electrification (Batteries, Electric Drive, Grid/Infrastructure)	$140,530,000	$160,000,000
Energy Efficient Mobility Systems (including Vehicle Systems)	$24,385,000	$41,000,000
Advanced Combustion Engine and Fuels R&D	$71,440,000	$65,200,000
Materials (Lightweight and Propulsion)	$28,100,000	$25,000,000
Technology Integration (Data and Systems Research, Advanced Vehicle Technology Competitions, and State/Alternative Fuel Fleet Program)	$37,400,000	$41,300,000
Analysis	$5,100,000	$5,000,000
VTO TOTAL	$306,955,000	$337,500,000

Outreach & Deployment History and Transformation to Technology Integration

History:

- First Clean Cites Coalition designated in 1993
- Scope: EPAct defined alternative fuels to displace petroleum
- High TRL
- Speed adoption through FOAs that focused on deployment of vehicles and infrastructure
- Coalitions facilitate change by localizing policies and resources
- Promote alternative fuels through education and outreach
- Share best practices through stakeholder collaboration

Transformation:

- Nearly 100 Clean Cities Coalitions
- Scope: EPAct alternative fuels, electrification, hydrogen and EEMS
- Shifting focus to earlier stage TRL in support of other VTO programs
- Deemphasizing deployment of existing technologies
- **Living Lab FOAs** that cut across all technologies to collect data and lessons learned that provide important feedback to the VTO research program Information and Tools that provide **objective data, tools, and insights** to consumers, local communities, and other stakeholders
- Technical Assistance and Partnerships that enable **direct feedback** from experts, users, and other key stakeholders
- Local **Clean Cities** coalitions align their activities with EERE/VTO objectives to improve transportation energy efficiency and reduce transportation energy costs

Data and Systems Research - Core Activities

Provide objective/unbiased data and real world lessons learned that inform future research needs and support local decision-making

Financial Assistance - Living Labs

Information and Tools

Technical Assistance

Training, Outreach, Partnerships

Clean Cities Coalitions

Data and Systems Research - Core Activities

Financial Assistance

Competitively-awarded, cost-shared projects – Living Labs to inform future research

Information & Tools

Online calculators, station locators, case studies mobile apps using objective data (includes statutorily required activities – AFDC and Fuel Economy Guide)

Technical Assistance & Training

Online and in-person

Boots-on-the-ground experts, technical forums, user groups

Direct Coalition Support

Direct grants to local coalitions for specific deliverables

Clean Cities Coalitions

Nearly 100 ***Clean Cities coalitions*** with thousands of stakeholders provide a ***coordinated "boots-on-the-ground" approach*** and significantly ***extend VTO reach*** with a ***consistent message***

- DOE designates (and re-designates, every 3 years) coalitions as "Clean Cities" coalitions
- Coalitions operate independently of DOE and have Board of Directors
- Coalitions are funded by multiple sources and work with multiple other agencies
- DOE provides awards under existing cooperative agreement
- For DOE funding, coalitions must meet specific tasks/deliverables

Information & Tools – PUBLIC INFORMATION PROGRAM

- Responds to EPACT 1992 (Section 405) statutory requirements for Alternative Fuels Public Information Program
- Lead: NREL
- Significant 3rd party use, API data downloads and referrals
- Popular features:
  - Station locator
  - Laws and incentives database

Alternative Fuels Data Center

Top 13%
of all Federal sites

#276 *of* 2100

444K views/month

Data based on monthly pageviews from 7/26/2016 to 8/24/2016 and compared to data gathered about Federal Sites on analytics.usa.gov. See https://analytics.usa.gov/#explanation for details on how analytics.usa.gov tracks data on how people are interacting with the government online. AFDC uses Google Analytics for web traffic statistics and FuelEconomy.gov uses Urchin.

Information & Tools - FUEL ECONOMY GUIDE

- Responds to Energy Policy and Conservation Act of 1975 statutory requirements for DOE to publish and distribute the Fuel Economy Information booklet (with EPA)
- Lead: ORNL
- Significant 3rd party use, API data downloads and referrals
- Fueleconomy.gov key feature: find-a-car tool

www.fueleconomy.gov
the official U.S. government source for fuel economy information

Top 1%
of all Federal sites

#18 *of* 2100

26.5M views/month

Data based on monthly pageviews from 7/26/2016 to 8/24/2016 and compared to data gathered about Federal Sites on analytics.usa.gov. See https://analytics.usa.gov/#explanation for details on how analytics.usa.gov tracks data on how people are interacting with the government online.

TECHNICAL ASSISTANCE & TRAINING

Tiger Teams

- Incident investigations (evaluate technology failures)
- Capture early adopter lessons learned, develop best practices
- Address unforeseen permitting and safety issues
- Identify technology gaps in the field to inform research priorities

Technologist in Cities Pilot

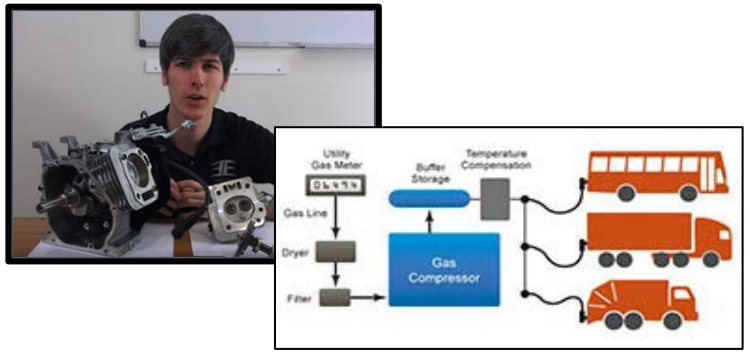
- Embedded technical expert
- Connects to SMART Mobility
- Supports DOE/DOT MOU

Technical Response Service (TRS)

- **Information portal to rapidly connect stakeholders with breadth of expert data, tools, resources, and Clean Cities coalitions**
- **Individualized assistance for research and making informed decisions**
- **Expert resource for quick turnaround VTO information needs**

TECHNICAL ASSISTANCE & TRAINING

- Technical forums, workshops, and user groups
- Clean Cities University (CCU): On-line courses related to advanced vehicle fuels and technologies, and skillful use of VTO tools, data, and information resources
- AFV workplace safety training
- First responder, code official, and fire and safety personnel training
- Clean Cities Workforce Development Program: College interns learn about VTO technologies, mentored by Clean Cities coalitions



Financial Assistance

FY 2016 VTO Program Wide - Area of Interest 1

EV Everywhere Plug-In Electric Vehicle Local Showcases

The objective of AOI 1 is to promote and demonstrate PEV use by establishing local showcases that provide a hands-on consumer experience and in-depth education in a conveniently located, brand-neutral setting.

3 Projects Awarded
Total DOE Funding: $2,443,427
Cost Share Requirement: 50%

1. **American Lung Association**
   Project Title: Midwest EVOLVE (Midwest Electric Vehicle Opportunities: Learning, Events, Experience)

2. **Forth**
   Project Title: Northwest Electric Showcase

3. **Plug In America**
   Project Title: Advancing PEV Adoption in New England

Financial Assistance

FY 2016 Multi-topic - Area of Interest 3

Alternative Fuel Vehicle Community Partner Projects

The objective of this Area of Interest is to fund projects that would accelerate the use of commercially available electric drive and alternative fuel vehicles, and supporting infrastructure technologies, through community-based partnerships among state and local governments and the private sector.

2 Projects Awarded
Total DOE Funding: $8,532,313
Cost Share Requirement: 50%

1. **PacifiCorp**
   Project Title: WestSmartEV: Western Smart Plug-in Electric Vehicle Community Partnership

2. **Gas Technology Institute**
   Project Title: U.S. Fuels Across America's Highways - Michigan to Montana (M2M)

Financial Assistance

FY 2016 VTO Program Wide - Area of Interest 10

Alternative Fuel Vehicle Workplace Safety Programs

The objective of AOI 10 is to provide safety training and guidance related to maintenance and garage facility upgrades and building modifications that will support the use of alternative fuel vehicles (AFVs). This AOI is focused only on facilities with EPACT defined natural gas, propane, and hydrogen vehicle refueling infrastructure.

2 Projects Awarded
Total DOE Funding: $1,499,965
Cost Share Requirement: 10% or 20%

1. **Institute of Gas Technology / Gas Technology Institute**
   Project Title: Training for Cost-Effective Code-Compliant Maintenance Facilities

2. **Marathon Technical Services USA Inc.**
   Project Title: Safety Training and Design, Permitting and Operational Guidance for Garage Facilities Maintaining and Parking Natural Gas, Propane and Hydrogen Vehicles

Financial Assistance

FY 2017 Vehicle Technologies Deployment – AOI 2

"Living Labs" Energy Efficient Mobility Systems Projects

POSTERS

The objective of this area of interest is to develop and implement projects and tools that demonstrate and assess the return on investment (ROI) of energy efficient "smart" mobility systems that holistically reduce energy consumption while delivering the benefits of new mobility technology.

3 Projects Awarded
Total DOE Funding: $4,807,068
Cost Share Requirement: 50%

1. **Rensselaer Polytechnic Institute**
   Project Title: Collaborative Approaches to Energy-Efficient Logistics in the Albany - New York City Corridor

2. **Pecan Street Inc.**
   Project Title: Electric Last Mile Project

3. **City of Seattle Department of Transportation**
   Project Title: Making the Business Case for Smart, Shared, and Sustainable Mobility Services

Image credits: DOE/NREL

Advanced Vehicle Technology Competitions - EcoCAR 3

Advanced Vehicle Technology Competitions

Developing the scientists and engineers to address our energy needs.

- More than 16,500 students have participated
- 93 North American universities have participated since 1989.
- 83% of AVTC graduates have entered the automotive industry.
- 69 patent applications submitted by AVTC graduates.

EcoCAR3
Advanced Vehicle Technology Competition

ecocar3.org

Advanced Vehicle Technology Competitions - EcoCAR 3

- 4 year competition (2014 – 2018).
- Based on a real-world vehicle design process.
- DOE is teaming with General Motors and more than 30 other government and industry leaders.

16 North American Universities

Arizona State University
California State University – LA
Colorado State University
Embry-Riddle Aeronautical University
Georgia Institute of Technology
McMaster University
Mississippi State University
Ohio State University
Pennsylvania State University
University of Tennessee, Knoxville
University of Alabama
University of Washington
University of Waterloo
Virginia Tech
Wayne State University
West Virginia University

Key Questions that Technology Integration Seeks to Answer

- **As new technologies enter the market…**
  - How effective are they?
  - Are there critical challenges requiring additional research to overcome? What are they?
  - What improvements are needed?

- **Which technology is best to address different issues and are most cost effective?**

- **What types of data need to be gathered on new vehicle technologies?**

Thank you!

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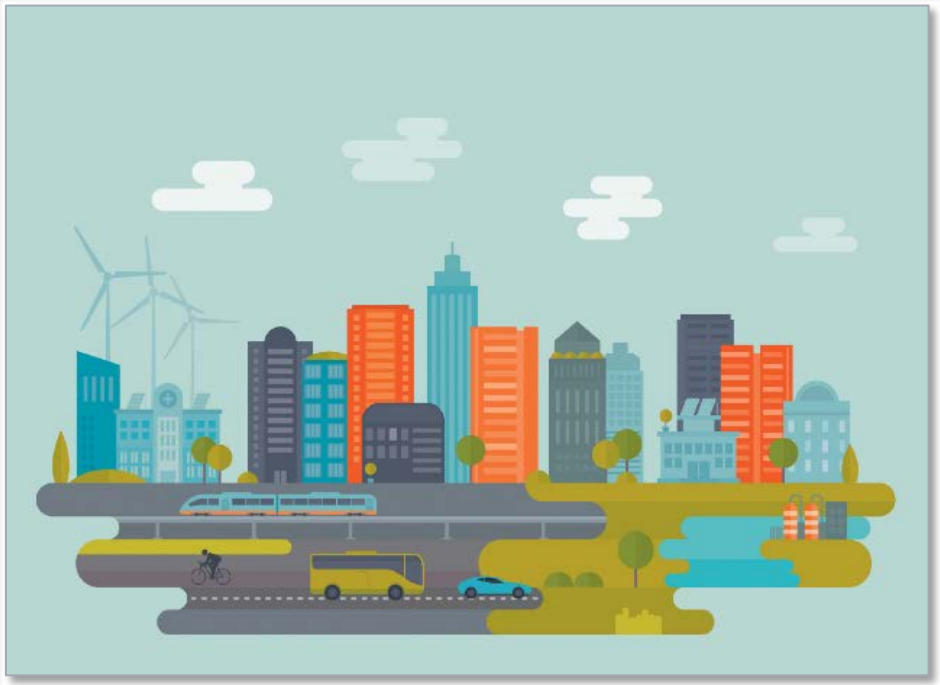

A Maximum-Mobility, Minimum-Energy Future